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10/563,711	01/06/2006	Jill MacDonald Boyce	PU030197	1213

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EXAMINER	
BEKELE, MEKONEN T	
ART UNIT	PAPER NUMBER
2624	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/563,711	BOYCE ET AL.	
	Examiner	Art Unit	
	MEKONEN BEKELE	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 March 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01/06/206* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *01/06/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims1-10 are pending in this application.

Priority

2. Applicant's claim for domestic priority under 35 U.S.C.119 (e) is acknowledged based on the provisional application 60485891, filed on 07/09/2003.

Drawings

3. The drawings filed on 01/06/2006 are accepted for examination.

Claim Rejections - 35 USC § 101

4. In view of the Applicant's amendments, the claims rejections (1-6) are expressly withdrawn.

Response to Argument

5. Applicants' response to the last Office Action filed on 12/23/2008 has been entered and made of record.

6. Applicant's arguments filed on 03/19/2009 with respect to claims 1-10 have been fully considered, but they are not persuasive, see discussion below.

a) At page 6 in 3rd paragraph, claim 1, applicants argue that *lu et al. fail to disclose or remotely suggest the concept of "creating, for each macroblock, a noise reduced macroblock using the N sets of motion estimation data."*

As to the above argument [a], examiner respectfully disagree with the applicants because, lu disclosed a method of generating noise reduced block (*macroblock*) for each block M in a current frame based on estimated velocities of 2L neighboring frames (Figs. 4 and 5), wherein the estimation is carried out by applying the least trimmed square (LTS) algorithm between the current motion block M and the set of 2N velocities corresponding to the 2L neighboring frames (Abstract and Figs. 4-5).

Based on the above explanation, as best understood by examiner, lu teaches the concept of *creating, for each macroblock* **(Fig. 4, page 5 lines 13-16, the motion block converter 22 divides frame k into a plurality of distinct blocks (*macroblocks*), each of which is successively selected as a current block)**, *a noise reduced macroblock* **(Abstract, page 3 lines 1-6, Figs. 2, 4 and 5, the motion vector (velocities) are used to reduce noise in the video signal, specifically, the noise reduced pixels values of a current frame(see Fig. 2) of the video image are generated by tracking individual pixels in the block (macroblock) from frame to frame across the plurality of frame**) *using the N sets of motion estimation data* **(Figs. 4 and 5, the motion block M is estimated using the 2L neighboring frames velocities $v_1 \ldots v_m$).**

b) At page 6 in the 1st paragraph, claim 1, applicants argue "*it is clear from the disclosure and the figures that such motion estimation is not used as an input to the noise reduce"*

As to the above argument [b], examiner respectfully disagree with the applicants because, lu clearly teaches a motion vector are used to reduce a noise in the video signal. Specifically Figs. 4 and 5 show that the 2L neighboring frames velocities $v_1 \ldots v_m$ of the neighboring frames $K = \{k-L,..k-1,k+1,..k+L\}$ are used as input to estimate the motion of a

motion block M in frame k. Thus, as best understood by examiner, the neighboring frames velocities $v_1 \ldots v_m$ are used as input to estimate the motion of a motion of each motion block M in frame K, and these motion velocities (motion vectors) are used as tolls to reduce noise in the video signal (page 3 lines 1-5, Figs. 4-5, page 5 lines 13-22).

c) At page 6 in the 3rd paragraph, claim 1, applicants argue that Lu et al. fails to disclose or suggest estimating motion for each macroblock in an input video signal to yield N sets of motion estimation decision sets, each set including a reference picture index and a motion vector."

As to the above argument [c], examiner respectfully disagree with the applicants because, lu teaches $p_{ij}(l) = p_{i,j}(k) + v(l-k)$, where $p_{ij}(l)$ be the position of a pixel p in frame l and p is at (i, j) in frame k, and v is velocity to be estimated. Thus, the reference index **corresponds to the reference frame index** l, and the motion vector **corresponds to the velocity v.**

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35U.S.C.102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. *Claims 1-4, 6 and 7 are rejected under 35 U.S.C. 102 (b) as being anticipated by lu, Siu-Leong (hereafter lu), European Patent Application No. 0 614 312 A2, published on 09/07/1994.*

As to claim 1, lu teaches A method for encoding a video signal with reduced noise (**Abstract, A method and system for reducing noise in a video signal which includes a plurality of video frame**), comprising the steps of:

estimating motion for each macroblock in an input video signal N times (where N is an integer) to yield N sets of motion estimation decision sets (**page 5 lines 13-44, Figs. 4 and 5, determining an approximate motion vector for the motion block across the plurality of video frames. Fig. 5 illustrate that N=2L motion estimates between the block of the current frame and the blocks of N=2L neighboring frames are calculated and optimized**), each set including a reference picture index and motion vector(**page, lines 45-54, an equation 2, the estimated motion of block M in frame k using frame k and the set of its 2Lneighboring frames is given by** $p_{ij}(l) = p_{ij}(k) + v(l-k)$ **,where, $P_{ij}(l)$ is a pixel position in frame I taken along the velocity vector v, relative to the corresponding pixel value $P_{ij}(k)$ from the current frame k. Thus, I** corresponds to the reference picture index **and v.(I-k) corresponds** to the motion vector).

creating, for each macroblock, a noise reduced macroblock using the N sets of motion estimation data **(page 3 lines 2-9, the motion vectors are used to reduce noise in the video signal. A mathematical function is applied to each of the pixel values included in the averaged video frame to determine whether the noise reduction was effective. The averaged pixels values are discarded if the noise reduction is determined to be ineffective).**

encoding each noise reduced macroblock using a best one of the motion estimation data sets (**page 4 lines 7-9, motion vectors, MV and CMV, as a part of its encoding operation. These motion vectors may be provided to the MPEG encoder to aid in encoding the noise-reduced image, see also page 7 lines 45-47).**

As to claim 2, Iu teaches the step of estimating motion further includes the step estimating the motion N times using each of N different reference pictures **(Fig. 5 and page 2 lines 55-58, a trajectory vector is first calculated for a block pixels by matching the block in each of a plurality of preceding and succeeding 2L=N frames, and then using the robust estimator, such as a least-trimmed squares fitting procedure to obtain the trajectory vector).**

As to claim 3, Iu teaches the step of creating the noise reduced macroblock further comprises the steps of:

selecting at least a plurality of the N sets of motion estimation decision sets **(Fig. 2 and page 4 lines 41-45, Outlier rejector 40 computes a weighted sum of trimmed square value for each pixel in the motion block. A function of each weighted trimmed square value is**

compared to a threshold to determine if a noise reduced value for the pixel should be calculated and used in a noise reduced video frame); and

temporally filtering each pixel in the macroblock to using the selected motion estimation decision sets (**page 5 lines 1-5, two threshold values, Tc and Tb are used. Tc is used to determine whether individual frames should be omitted from the calculation of corrected displacements by block 40 and the threshold value; Td is used to determine whether the noise reduced pixel value should replace the original pixel value).**

As to claim 4, Iu teaches selecting step further comprises the steps of: generating a predictor for each motion estimation decision set **(page 6 lines 53-57-page 7 lines 1-28, Iu specifically teaches a plurality of sum of weighted square error calculators (see Fig. 8) where each sum of weighted squared error calculator receives a respective trial corrected motion vector. Each of the calculators then performs a sum of weighted squared error calculation on the two blocks of pixel data to accordance the sum of weighted square error (WSSE) equation 3. WSSE is given as a function of the weighted intensity of the target frame and the weighted intensity of current frame.** Generating a predictor for each motion estimation decision set **corresponds to generating the weighted intensity value for each current frame).**

calculating a difference between the predictor and the current pixel **(page 7 lines5-20, equation 3, the WSSE is given by:**

$$wsse(p_{i,j}(k)) = \sum_{\{m,n\}\in W} [I_k(p_{i+m,j+n}(k)) - I_i(p_{i+m,j+n}(k))]^2$$

Predictor **Current**

determining whether the difference is less than a threshold **(page 8, lines 12-38, equations 3 and 5, according to equations 3 and 5, the threshold corresponds to Tc ***

WTS/L); and if so selecting the motion estimation decision set whose difference is less than the threshold (**page 8, lines 29-38, if WSSE < Tc*WTS/L, the frame is not rejected form the trajectory calculation);**

Regarding claim 6, all claimed limitations are set forth and rejected as per discussion for claims 1 and 2

Regarding claim 7, all claimed limitations are set forth and rejected as per discussion for claims 1.

Claim Rejections - 35 USC § 103

The following is a quotation of the 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained thought the invention is not identically disclosed or described as set forth in section 102 of this title, if the difference between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 5 and 10 are rejected under 35 U.S.C 103 as being unpatentable over lu, Siu-Leong (hereafter lu), European Patent Application No. 0 614 312 A2, published on 09/07/1994, in view of de Haan, et al. (hereafter de Haan), "Memory Integrated Noise Reduction IC for Television" IEEE Transactions on Consumer Electronics, Vol. 42, No. 2, MAY 1996, pp175-181.

As to claims 5 and 10, however it is noted that lu does not specifically teaches "the step of spatially filtering the input video prior to estimating motion" although filtering for nose reduction is a well known design choice.

On the other hand the IC for noise estimation and the 2-D spatial noise filtering for TV of de Haan teaches spatially filtering the input video prior to estimating motion (**Abstract, Fig. 7 page 175 left col. last paragraph, Fig.7 illustrates a cascade of spatial and temporal noise filtering where spatial filtering is performed before motion estimation).**

It would have been obvious to one of ordinary skill in the art to incorporate noise estimation and the 2-D spatial noise filtering of de Haan into the method of reducing noise in video signal of Iu, because that would have allowed user of Iu to reduce the effect noise in video signals using the automatically-adaptive 2-D spatial noise filter of de Haan.

9. *Claim 8 and 9 are rejected under 35 U.S. C 103 as being unpatentable over Iu, Siu-Leong (hereafter Iu), European Patent Application No. 0 614 312 A2, published on 09/07/1994, in view of the applicants' admitted prior art (Fig. 1).*

As to claim 8, it is however noted that Iu does not teach "a reference picture store for storing coded pictures and where the motion estimation stage estimates the motion N times using each of N different stored reference pictures" **although Iu suggests motion estimation between the block of the current farm and the blocks 2L=N frames.**

On the other hand the admitted prior art **(Fig. 1)** teaches a reference picture store (**Fig. 1 element 16)** for storing coded pictures**(page 3 line 6)** and where the motion estimation stage estimates the motion N times using each of N different stored reference pictures(**page 3 lines 7-10).**

It would have been obvious to one of ordinary skill in the art to incorporate the admitted prior art video encoder into the method of reducing noise in video signal of lu, because that would have allowed user of lu to apply coded pictures as references for motion estimation where the estimated multi-frame motion information is used for temporal denoising the input images, which are to be coded.

As to claim 9, lu teaches means for applying the motion estimation decision sets to filter; for noise reduction **(page 3 lines 2-9, the motion vectors are used to reduce noise in the video signal. A mathematical function is applied to each of the pixel values included in the averaged video frame to determine whether the noise reduction was effective. The averaged pixels values are discarded if the noise reduction is determined to be ineffective);**

However it is noted that lu does not specifically teach "a reference picture"; "a reference picture store for storing the coded pictures; means for applying the stored previously coded pictures as input video stream to for estimating the motion for each macroblock to yield the N sets of motion estimation decision sets**" although lu suggests, determining an approximate motion vector for the motion block across the plurality of video frames. Fig. 5 illustrate that N=2L motion estimates between the block of the current frame and the blocks of N=2L neighboring frames are calculated and optimized, (page 5 lines 13-44, Figs. 4 and 5));**

On the other hand the applicants admitted prior art figure 4 teaches a reference picture; a reference picture store for storing the coded pictures **(Fig. 1 element 16);**

means for applying the stored previously coded pictures as input video stream to for estimating the motion for each macroblock to yield the N sets of motion estimation decision sets **(Fig. 1, page 3 lines 6-10).**

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, THIS ACTION IS MADE FINAL. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Mekonen Bekele whose telephone number is 571-270-3915. The examiner can normally be reached on Monday -Friday from 8:00AM to 5:50 PM Eastern Time. If attempt to reach the examiner by telephone are unsuccessful, the examiner's supervisor AHMED SAMIR can be reached on (571)272-7413. The fax phone number for the organization where the application or proceeding is assigned is 571-237-8300. Information regarding the status of an application may be obtained from the patent Application Information Retrieval (PAIR) system. Status information for published application may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished application is available through Privet PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have question on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866.217-919 (tool-free)

/MEKONEN BEKELE/
Examiner, Art Unit 2624
June 6, 2009.

/Samir A. Ahmed/

Supervisory Patent Examiner, Art Unit 2624